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"THE OLDEST KNOWN REPTILE."—*ISODECTES PUNCTULATUS* COPE

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Recently M. Thevenin has described and figured a very interesting new air-breather from the Stephanian, or uppermost Carboniferous, of France, under the name *Sauravus costei*, referring it to the Reptilia. The form, of small size, has a long body, probably a long tail, vertebrae with persistent notochord, apparently no hypocentra, single-headed ribs attached intercentrally, two sacral vertebrae, ossified carpus and tarsus, and a phalangeal formula, for the hind feet of 2, 3, 4, ?, ?. There are twenty-three or twenty-four dorsal vertebrae; the humerus shows no epicondylar foramen; the tarsus has two bones in the proximal row, a centrale and four distalia; and slender ventral ribs are present. The author's conclusions are:

> En résumé, *Sauravus costei* du Houiller de Blanzy est le plus ancien Reptile trouvé jusqu'à présent en France. Malgré son ancienneté, il est déjà très évolué, car ses membres sont à peu près aussi parfaits que ceux des Sauriens actuels, quoique la coalescence des os du tarse soit moins achevée que chez ces derniers. Il a pourtant des charactères primitifs; par ses vertèbres ensablier à notochorde continue et par ses côtes ventrales, c'est un Rhynchocéphale. Il doit, jusqu'à ce que son crâne soit connu, être provisoirement placé dans le même ordre que *Palaeohatteria*, *Callibrachion*, *Kadaliosaurus*, qui sont d'âge un peu plus récent; il est plus perfectionné que le premier de ces genres.[1]

In the *American Naturalist* for April, 1896, Professor Cope, in a discussion of the Cotylosauria, made the following statement:

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[1] *Annales de paléontologie* (1907), Pt. 3, p. 19.

> A single genus has been found in the Coal Measures of Ohio, which is represented by a species which I shall call *Tuditanus punctulatus*. It is of small size, and the maxillary teeth are of equal length. I can not distinguish it from *Isodectes*, which belongs to the Pariotichidae. The other species which are referred to *Tuditanus* are Stegocephalia. *This is the first identification of a true reptile in the Coal Measures.*

In the following year (*Proc. Amer. Phil. Soc.* 1897, p. 88), under the heading Isodectes punctulatus, he said:

> A collection from Linton, Jefferson County, Ohio, obtained from Mr. Samuel Houston, contains the greater part of the skeleton of what I suppose is this species. The head, scapular arch and [most of the] fore limbs are lost. The remainder agrees very well with the typical specimen which was obtained by Dr. Newberry from the same locality and horizon . . . . The specimen is of importance as pertaining to the oldest known reptile, and the only one which has been, thus far, positively identified from the Coal Measures.

The paper was not published till after Cope's death, and he did not see all the proofs.

Hay, in his catalogue, for what reason I do not know, refers the species back to *Tuditanus* and the amphibia, and there has been no further reference since of any kind to the species.

Very recently, through the kindness of Secretary Walcott of the Smithsonian Institution, and Professor Dean of Columbia University, the type specimen of *Tuditanus punctulatus*, and the specimen referred to above by Professor Cope, have come under my observation. The original type of *Tuditanus punctulatus* will be shortly discussed by Mr. Moodie of this university. The specimen which Professor Cope so positively and decisively referred to the Reptilia is of great interest in view of the recent discussions as to the origin of that class of vertebrates. Because of recent discoveries connecting so intimately the Stegocephalia with the primitive reptiles, it is somewhat hazardous to say with assurance that the specimen really is that of a true reptile. Perhaps all of significance that is now left as a distinguishing characteristic of the two classes is the greater or less development of the parasphenoid, and, as the skull is wanting in this particular specimen, as it also was in the specimen referred by Thevenin to the reptilia, we must await future discoveries for the final solution of the question. It is my opinion, however, that Cope was right, and the form should be, provisionally at least, referred to the reptilia.

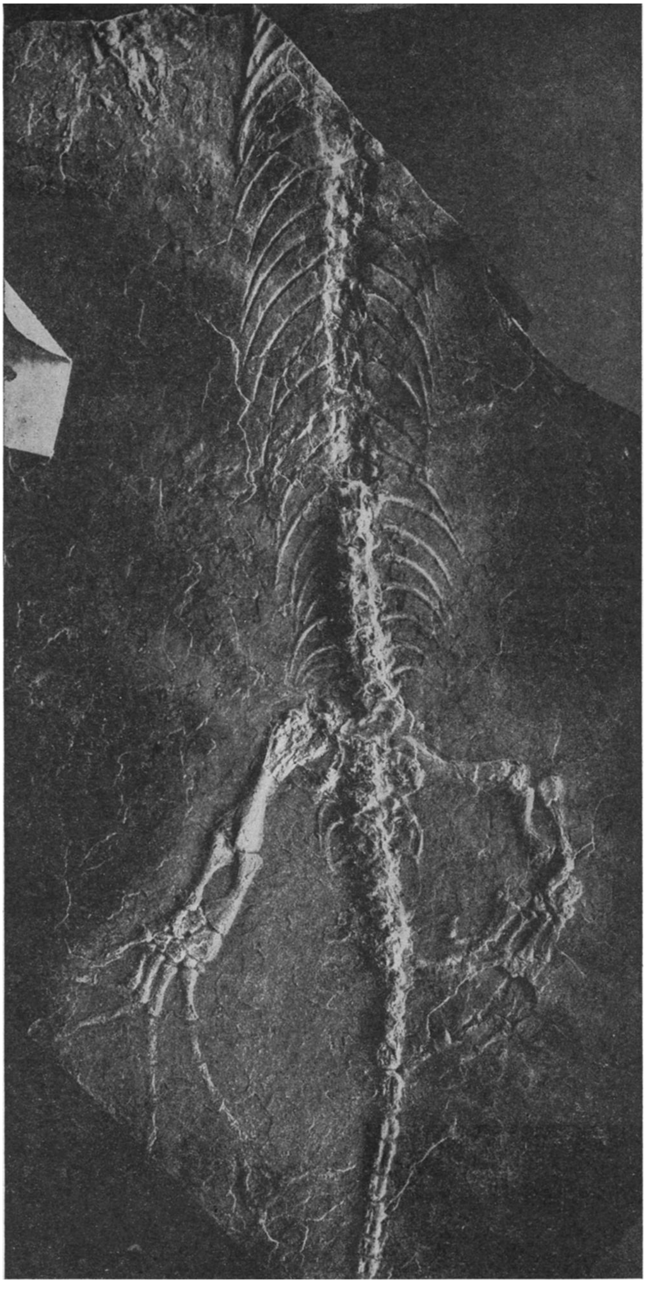

FIG. 1.—*Isodectes copei* Will., enlarged (plesiotype of *Tuditanus punctulatus* Cope).

I give herewith an enlarged photograph of the specimen, which will show, at a glance, the striking characteristics of the form; the figure given by Cope is in some things incorrect and obscure. In a very careful study of the specimen, I find no corrections of his rather brief description, but there are some facts that I can add with assurance. Positive indications of twenty-three dorsal vertebrae are present, and, since the left manus is doubtless in its normal position on the block, it is hardly possible that there could have been more than one or two more, that is, the number is doubtless the same as that of *Sauravus*. The ribs are small, slender, and curved, moderately dilated at the proximal extremity, but without real differentiation into head and tubercle; they are all attached intervertebrally. The vertebrae were certainly amphicoelous, and doubtless with persistent notochord, agreeing with those of *Sauravus*, and the Microsauria generally. The vertebral spines are rudimentary; and there are no indications of any kind of ventral ribs—one is safe in saying that the animal in life had none—in this respect differing from *Sauravus*. Nor is there any distinct evidence of hypocentra, though it is not impossible that such bones of small size may have been present. All the dorsal vertebrae bear ribs, and the first three of the caudal series also. Two vertebrae intervene without free ribs. On the left side the upper border of an ilium is discernible, close to the sides of the centra, and between them and the head of the femur. This ilium was certainly united to these two vertebrae. There were two sacral vertebrae, as in *Sauravus*, a reptilian character. The specimen lies on its ventral side, and the pubes and ischia, hence, are not visible. The tail, like the body, was evidently long and slender.

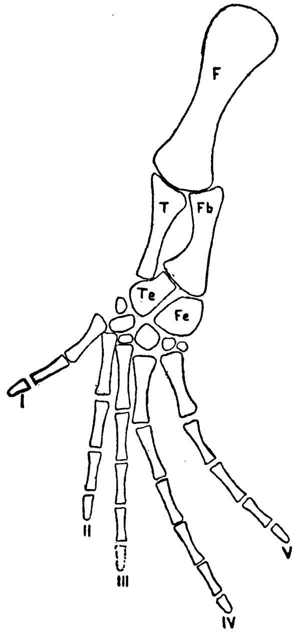

FIG. 2.—Left hind leg and foot of *Isodectes copei* Will., enlarged.

The perfection of the hind limbs is such that scarcely any thing more could be wished for. I have no emendations to make of Cope's determinations, save to say that the phalangeal formula was certainly 2, 3, 4, 5, 4. I accept Cope's interpretation of the tarsus, as shown in the figure, with the proviso that possibly the proximal row may be composed of the three bones, tibiale, intermedium, and fibulare, but I do not think so. The bones exhibit full chondral ossification, and not perichondral alone, as is the case with the Branchiosauria, and many of the Microsauria also, probably. Whether microsaurian or reptilian in nature, the presence of such a tarsus, with its fusion of intermedium and centrale is of great interest, since *this is the oldest known tarsus and foot of an air-breather in existence*, the Linton horizon, of middle or lower Pennsylvanian being lower than others hitherto known yielding Microsaurian remains.

The imperfect left hand is the only part preserved of the fore limbs. Four metacarpals are, however, clearly shown, and two ossified carpals, together with several phalanges.

The apparent absence of ventral ribs and the possible absence of hypocentra would seem to remove our form from direct ancestral relationships with the later reptiles, but there is not a solitary character which can be discovered in the specimen that is not reptilian. That the specimen pertains to the same species, or even genus, as that represented by the type specimen of *Tuditanus punctulatus* is very doubtful, and Cope was not assured of the identity. That specimen indicates an imperfect chrondral ossification of the bones, and there are no signs of carpal bones, though the metacarpals are preserved. Until further evidence is forthcoming, the present specimen may be known as *Isodectes copei*, though the generic identity with the Permian form is very problematical.

M. Thevenin believes that his *Sauravus* is a rhynchocephalian; I cannot agree with him. In all probability the head of *Sauravus* will be found to be stegocrotaphous, of the Stegocephalian or Cotylosaurian type. If the parasphenoid is found to be considerably reduced in *Sauravus costei* and *Isodectes copei*, even though there be two occipital condyles, they must both be referred to the Reptilia; if not, they must be classified with the Microsauria. That the two forms are related one cannot doubt. But, wherever they may be finally placed, both clearly show reptilian characteristics. It is clear that the primitive reptilian phalangeal formula was that now persistent in the lacertilia and *Sphenodon*, 2, 3, 4, 5, 4. In *Ceraterpeton*, a later form than *Isodectes copei*, Woodward has demonstrated the formula 2,3,4,4,3, in one species at least. The number 2,3,3,3,3, so characteristic of the mammals, is a late specialization, and can have, in my opinion, no genetic relations with the similar formula in most turtles. In other words the phalangeal formula is not of the great importance that some authors have attached to it.

The attachment of the ribs to the intercentral space is very hard to explain under the supposition that the amphibian centrum is the hypocentrum; if the vertebrae are really composed of the pleurocentra, the entire, or apparently entire, loss of the hypocentra in these the earliest known air-breathers offers another bewildering problem.

There are those who believe that the reptiles arose from two distinct groups of the amphibia, one from the Microsauria, the other from the Temnospondyli; and I must confess that *Isodectes* helps that theory materially, for its relationships with the Microsauria on the one side cannot be gainsaid. But, the close relationships between such forms as *Pariotichus*, *Procolophon*, *Telerpeton*, the Pelycosauria, the Cotylosauria, Pareiasauria, and Temnospondyli complicate matters here exceedingly, and leave the whole subject still in great obscurity.